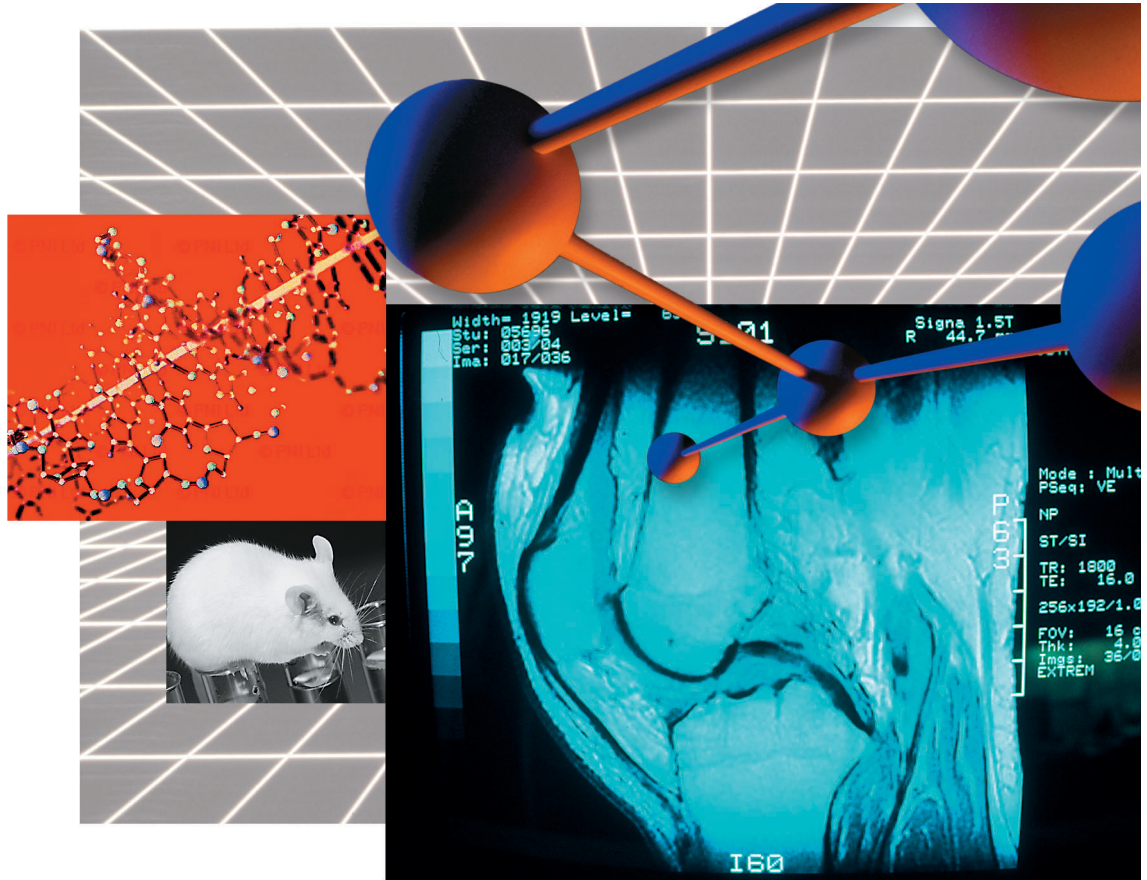


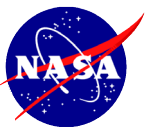
Precision 3-D Gamma Imaging System



NASA's Marshall Space Flight Center is developing three-dimensional (3-D) gamma imaging systems and is seeking commercial partners. These systems offer an attractive combination of precise 3-D imaging at much lower costs—improving resolution and quality of 3-D images yet cost less than comparable systems. Imaging time is also reduced. Potential uses include medical and research applications, such as small animal imaging and imaging of human organs.

Benefits

- High spatial resolution (down to 0.5 mm) and high energy resolution
- Production of full 3-D image
- Half the cost of comparable systems
- Greatly reduces collection times (approximately 10 minutes for small animal imaging)
- Freedom from distortions and instabilities
- Stationary imager does not require motion of the object under study or of the system components





Commercial Applications

- Medical diagnostic uses and research, including small animal and human organ imaging
- Microscopy, including molecular imaging
- Industrial quality control through high-resolution images of industrial objects for defect analysis
- Radiation detection

The Technology

NASA's high-precision, low-cost 3-D gamma imaging systems achieve the superior imaging accuracy and performance needed in most applications that currently use 3-D imaging. These systems were developed by NASA for use in medical research applications, including human organ imaging for diagnostic purposes and research involving small animals.

The imaging systems consist of three gamma ray imagers, placed in three orthogonal planes around the object under study. Each gamma ray imager has a coded mask and a position sensitive gamma ray detector. The thickness and composition of a coded detector plate in the mask can be changed to suit different high-sensitivity applications. A zoom feature can be easily incorporated by moving one or more of the coded masks.

Among the key innovations is the use of mathematical algorithms to obtain the high resolution images quickly. The algorithms are used to tell the system where the next image point will be. These algorithms take into account estimates of distribution uncertainty to obtain accurate data promptly. Advanced high-speed deconvolution algorithms are then used to translate the data obtained from the system into a full 3-D image.

Imaging system features include:

- Detection of energies in the range of 50 keV to 552 keV
- Capable of high counting rates (i.e. over 100k cps in each axis)
- Ratio of closed-to-open area in the plate is typically 0.6 to 0.8, depending on the application
- Current ability to image objects measuring up to 20 cm in each dimension—further development of the system will allow imaging of objects with larger dimensions
- High signal-to-noise ratio which achieves spectral resolution to distinguish specific radioisotope energies from background and scattered radiation
- Use of commercially available, fast digital processing hardware and software
- Digital output compatible with a high-speed digital computer

This technology is part of NASA's technology commercialization program, which seeks to stimulate commercial use of NASA-developed technologies.

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